

## PATENT ABSTRACTS OF JAPAN

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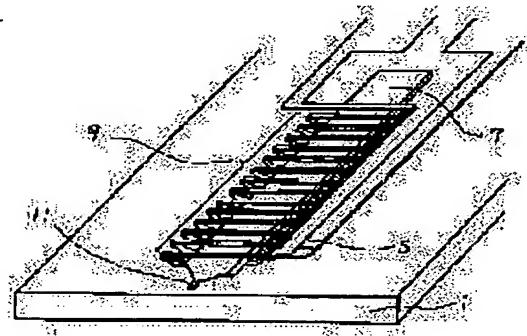
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## (54) THIN-FILM MAGNETIC HEAD

## (57)Abstract:

PURPOSE: To improve reliability and yield by forming a coil half body of a zigzag coil type thin-film magnetic head into a groove and constituting and arranging an upper magnetic core on a groove side from a coil juncture.

CONSTITUTION: This thin-film magnetic head is formed by using a ferrite substrate for a magnetic substrate 1 and using a Co-Tag-Zr-based amorphous alloy by sputtering, etc., on a magnetic core material. Forsterite is formed by sputtering, vapor deposition, etc., as a protective film. A coil conductor 5 consisting of Cr/Cu/Cr (Cr joining layer) is formed and thereafter, the film of a nonmagnetic insulating material is formed by sputtering, etc., to form a coil insulating layer. The insulating layer is superposed on the coil conductor after the formation of the coil conductor and thereafter, the head is completed by formation of the protective film, chipping, assembling stage, etc. The zigzag coil by stable coil contact is thus formed and the reliability and yield are improved.



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CLAIMS

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## [Claim(s)]

[Claim 1] It comes to carry out the laminating of a magnetic core and the main pole magnetic layer to Mizouchi formed on the magnetic film formed on the magnetic substrate or the nonmagnetic substrate in the core of a coil and a coil insulation layer, and said coil coil one by one through an insulating layer. Said main pole is the thin film magnetic head characterized by forming said magnetic core in a slot side rather than the coil connection of said coil coil in the thin film magnetic head which connects with the magnetic film formed on said magnetic substrate or the substrate magnetically by the core connection.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Industrial Application] This invention is a \*\*\*\* thing at the thin film magnetic head for high density magnetic-recording playback.

[0002]

[Description of the Prior Art] The vertical-magnetic-recording mold thin film magnetic head is having the conductor layer 5 which forms a coil layer up and down on both sides of an insulating layer 4 on the magnetic substrate 1 as are shown in the Japanese opportunity society (No.930-45) and shown in drawing 13 R>3, and structure which carried out the laminating of the up magnetic core 7 and the main pole magnetic layer one by one further (such structure is hereafter called spiral coil structure). on the other hand, a conductor as are shown in Journal of the Magnetics of Japan Vol.15 Supplemeent and No.S2(1991) P483-P490 and shown in drawing 14 — the thin film magnetic head of the structure which forms the up magnetic core 7 and a main pole magnetic layer in the core of the coil of a coil 5 is proposed (it is hereafter called zigzag coil structure). If zigzag coil structure as shown in drawing 14 is taken, compared with the case of the spiral coil structure of drawing 13 , resistance and the inductance of a coil can be made small.

[0003]

[Problem(s) to be Solved by the Invention] In respect of resistance and an inductance, to the spiral coil, although the above-mentioned zigzag coil was dominance, it was difficult to get and the problem was in dependability about the contact which the area of a manufacture process top coil connection is small, and whose connection number of copies is the number-of-turns individual need for a coil, and was stabilized.

[0004] The purpose of this invention is to form the zigzag coil by contact of the stable coil, and obtain improvement in dependability and a yield, without increasing a routing counter.

[0005]

[Means for Solving the Problem] The above-mentioned purpose is attained by forming the half-object of the coil of the zigzag coil mold thin film magnetic head in Mizouchi, and configurating an up magnetic core from a coil connection to a slot side.

[0006]

[Function] forming the half-object of the coil of the zigzag coil mold thin film magnetic head in Mizouchi, and configurating an up magnetic core from a coil connection to a slot side Since a coil connection can be formed on a flat surface ease [ connection with the coil half object formed in the upper layer ] — it becomes certain and the dependability of a coil and the high vertical-magnetic-recording mold thin film magnetic head of a yield can be offered.

[0007]

[Example] Hereafter, the example of this invention is explained using a drawing.

[0008] the top view and drawing 2 which show an example of the thin film magnetic head according [ drawing 1 ] to this invention — the A-A' sectional view of drawing 1 — it is — 1 — for a signal coil and 7, as for a coil connection and 11, a magnetic core and 9 are [ a magnetic substrate and 4 / a signal coil insulation layer and 5 / the main pole and 8 ] protective coats.

[0009] The ferrite substrate is used for the magnetic substrate 1 in this example. The Co-Ta-Zr system amorphous alloy is formed in magnetic-core material by sputtering etc. The signal coil forms Cu by vacuum evaporationo etc. by making Cr into a junctional zone. Forsterite is formed in a protective coat by sputtering, vacuum evaporationo, etc.

[0010] Hereafter, the production process of the thin film magnetic head by this invention is met and explained to drawing 3 — drawing 8 .

[0011] ( Drawing 3 ) To the magnetic substrate 1, form a slot by the dicing saw, ion etching, etc., and form the nonmagnetic insulating layer of \*\*\*\*, SiO<sub>2</sub>, and aluminum<sub>2</sub>O<sub>3</sub> grade by sputtering etc.

[0012] ( drawing 4 ) the coil which consists of Cr/Cu/Cr (Cr;junctional zone) — form a nonmagnetic insulating material by sputtering etc. and consider as a coil insulation layer, after forming a conductor 5.

[0013] ( Drawing 5 ) By sputtering etc., form membranes, carry out patterning of the Co-Ta-Zr system amorphous alloy, and form the up magnetic core 7 and the main pole 11.

[0014] ( Drawing 6 ) Form a nonmagnetic insulating material by sputtering etc. and consider as a core / coil insulation layer.

[0015] ( drawing 7 ) the etchback method, a lap, etc. — a coil — expose a conductor and form a coil connection.

[0016] ( Drawing 8 ) further — a coil — after forming a conductor, after piling up an insulating layer, a head is completed through protective coat formation, chip-izing, an assembly process, etc.

[0017] According to the above structure and the process, the zigzag coil by the coil contact stabilized since a coil connection was formed on a flat surface can be formed, and improvement in dependability and a yield can be obtained.

[0018] Although explanation of this example explained using the approach of embedding a coil in the slot formed in the magnetic substrate, as shown in drawing 9 , when the lower magnetic layer 2 is formed and the auxiliary magnetic pole 13 is formed on nonmagnetic substrate 1', as it is shown in drawing 10 , also when a nonmagnetic insulating layer is embedded in the slot of a magnetic substrate, it cannot be overemphasized that the same effectiveness is acquired.

[0019] Furthermore, as shown in drawing 11 and drawing 12 , also when the main pole is located in what kind of location, it cannot be overemphasized that the same effectiveness is acquired.

[0020] Moreover, at this example, although the perpendicular magnetic head explained, if it is the thin film magnetic head using a zigzag coil, it cannot be overemphasized that the same effectiveness can be acquired.

[0021]

[Effect of the Invention] Since a coil connection can be formed in a flat part according to this invention as explained above, the stable contact can be obtained and the reliable thin film magnetic head can be offered with the sufficient yield.

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## DESCRIPTION OF DRAWINGS

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**[Brief Description of the Drawings]**

[Drawing 1] It is the perspective view showing an example of the thin film magnetic head by this invention.

[Drawing 2] It is the A-A' sectional view of drawing 1.

[Drawing 3] It is a production process Fig. explaining an example of the thin film magnetic head by this invention.

[Drawing 4] Similarly it is a production process Fig.

[Drawing 5] Similarly it is a production process Fig.

[Drawing 6] Similarly it is a production process Fig.

[Drawing 7] Similarly it is a production process Fig.

[Drawing 8] Similarly it is a production process Fig.

[Drawing 9] It is the sectional view showing the example of others of this invention.

[Drawing 10] Similarly it is a sectional view.

[Drawing 11] Similarly it is a sectional view.

[Drawing 12] Similarly it is a sectional view.

[Drawing 13] It is drawing showing the conventional vertical recording mold thin film magnetic head.

[Drawing 14] It is drawing showing the magnetic head similarly.

**[Description of Notations]**

1 — Magnetic substrate,

1' — Nonmagnetic substrate,

2 — Lower magnetic layer,

4 — Signal coil insulation layer,

5 — Signal coil

6 — Insulating layer,

7 — Magnetic core

8 — Protective coat,

9 — Coil connection,

10 — Core embedded insulating layer,

11 — Main pole,

12 — Lower insulating layer,

13 — Auxiliary magnetic pole.

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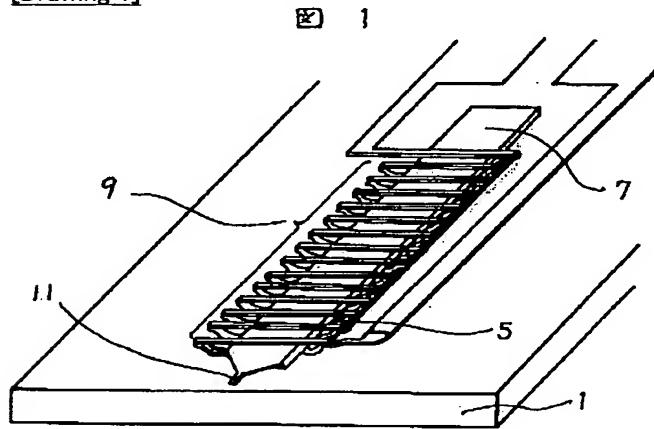
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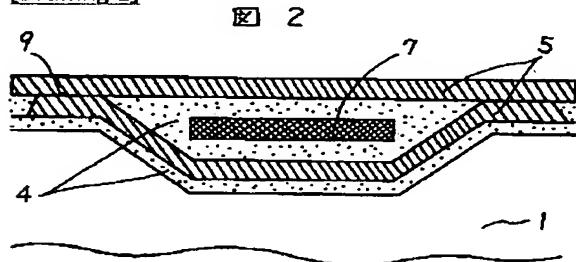
DRAWINGS

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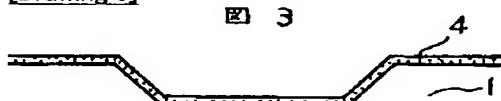
## [Drawing 1]



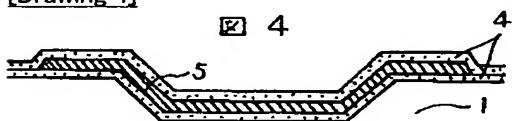
## [Drawing 2]



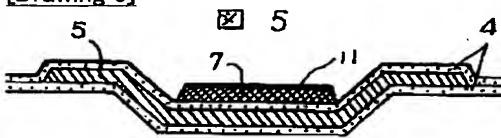
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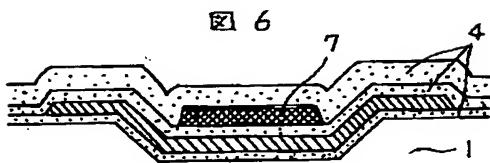
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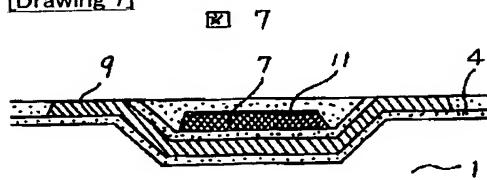
## [Drawing 5]



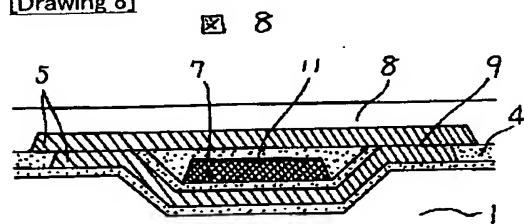
## [Drawing 6]



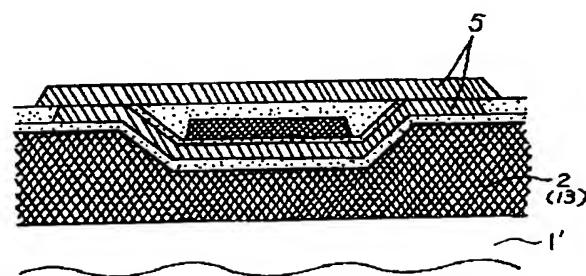
[Drawing 7]



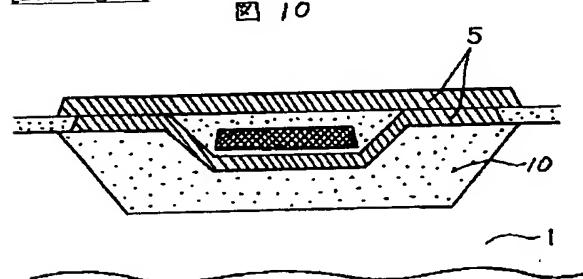
[Drawing 8]



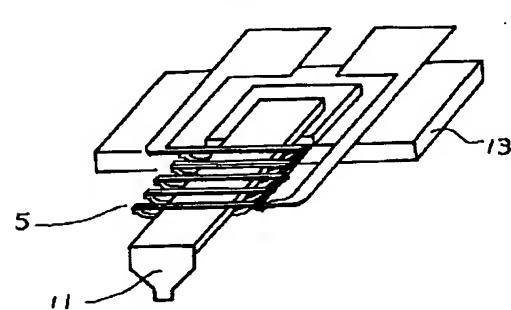
[Drawing 9]



[Drawing 10]

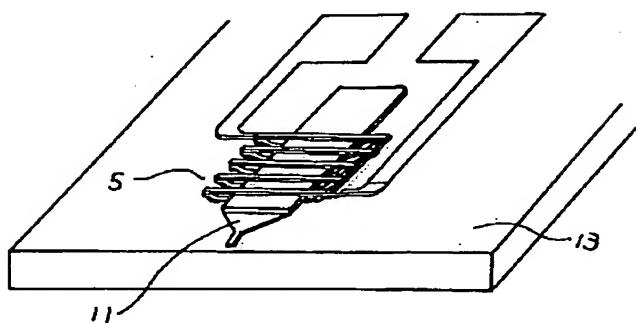


[Drawing 11]

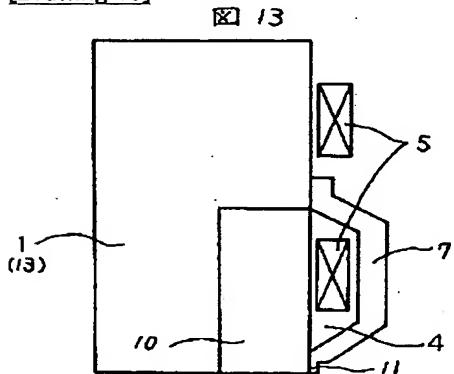


[Drawing 12]

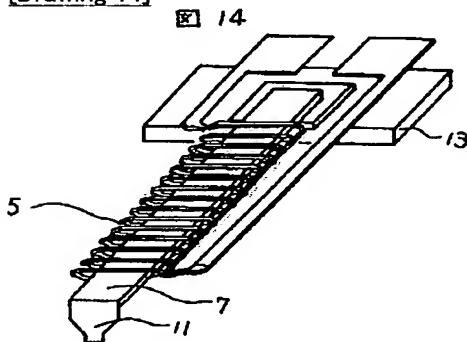
図 12



[Drawing 13]



[Drawing 14]



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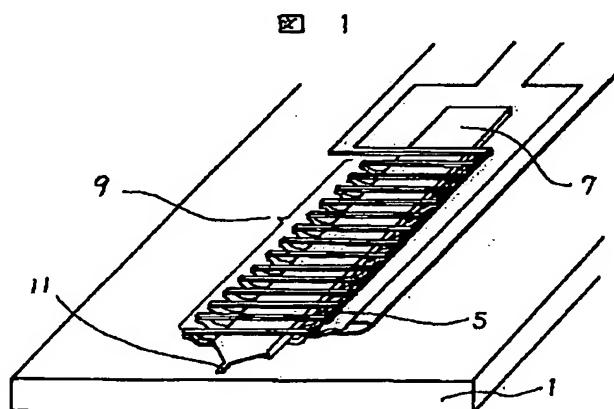
## (54)【発明の名称】薄膜磁気ヘッド

## (57)【要約】

【目的】本発明の目的は、工程数を増すこと無く、安定したコイルのコンタクトによるジグザグコイルを形成し信頼性、歩留の向上を得ることにある。

【構成】上記目的は、ジグザグコイル型薄膜磁気ヘッドのコイルの半体を溝内に形成し、かつ上部磁気コアをコイル接続部より溝側に構成配置することにより達成される。

【効果】ジグザグコイル型薄膜磁気ヘッドのコイルの半体を溝内に形成し、かつ上部磁気コアをコイル接続部より溝側に構成配置することにより、コイル接続部を平面上に形成できるため、上層に形成するコイル半体との接続が容易、確実となりコイルの信頼性、歩留の高い垂直磁気記録型薄膜磁気ヘッドを提供することができる。





## 【0021】

【発明の効果】以上説明したように、本発明によれば、コイル接続部を平坦部に形成することができるので、安定したコンタクトを得ることができ、信頼性の高い薄膜磁気ヘッドを歩留まり良く提供することができる。

## 【図面の簡単な説明】

【図1】本発明による薄膜磁気ヘッドの一例を示す斜視図である。

【図2】図1のA-A'断面図である。

【図3】本発明による薄膜磁気ヘッドの一例を説明する製造工程図である。

【図4】同じく製造工程図である。

【図5】同じく製造工程図である。

【図6】同じく製造工程図である。

【図7】同じく製造工程図である。

【図8】同じく製造工程図である。

【図9】本発明のその他の例を示す断面図である。

【図10】同じく断面図である。

【図11】同じく断面図である。

【図12】同じく断面図である。

【図13】従来の垂直記録型薄膜磁気ヘッドを示す図である。

【図14】同じく磁気ヘッドを示す図である。

## 【符号の説明】

1…磁性基板、

1'…非磁性基板、

2…下部磁性層、

4…信号コイル絶縁層、

5…信号コイル、

6…絶縁層、

7…磁気コア、

8…保護膜、

9…コイル接続部、

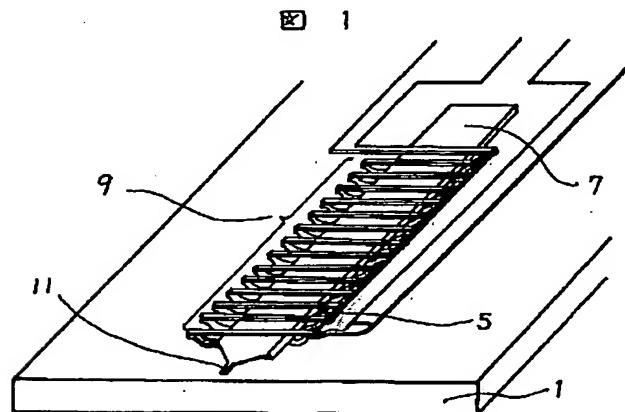
10…コア埋込絶縁層、

11…主磁極、

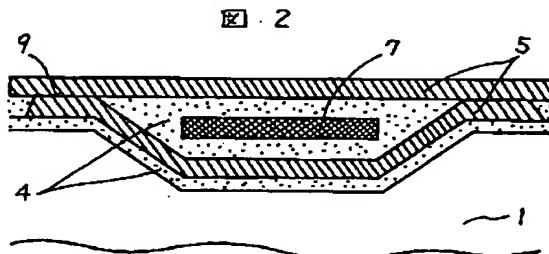
12…下部絶縁層、

13…補助磁極。

【図1】



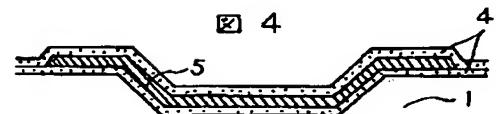
【図2】



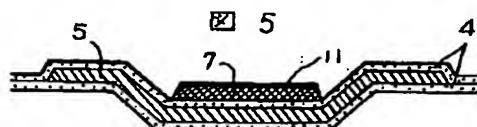
【図3】



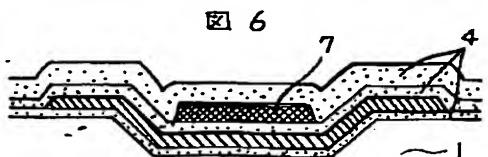
【図4】



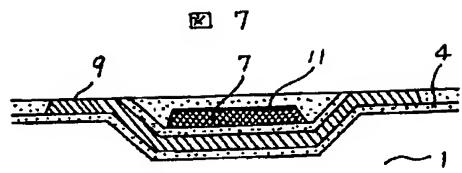
【図5】



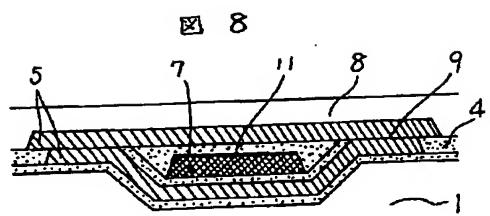
【図6】



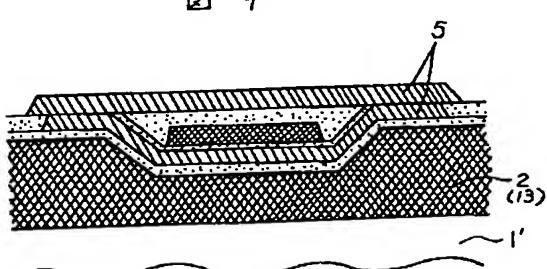
【図7】



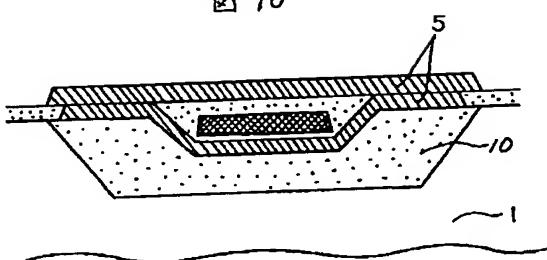
【図8】



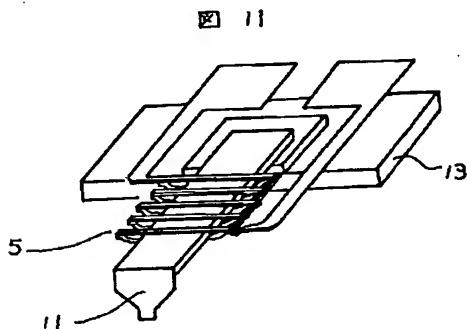
【図9】



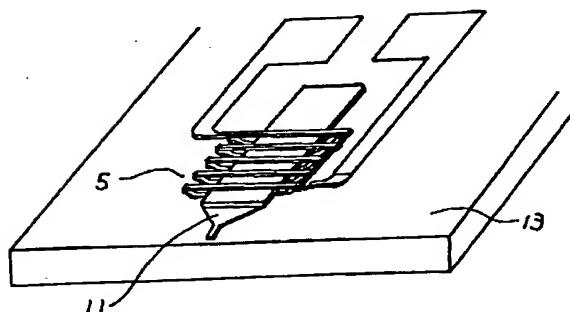
【図10】



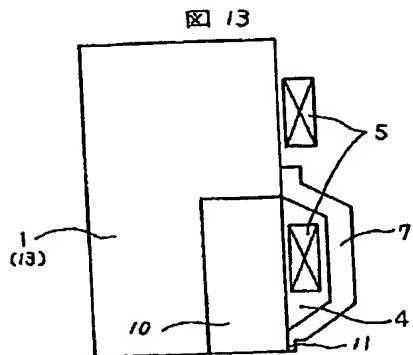
【図11】



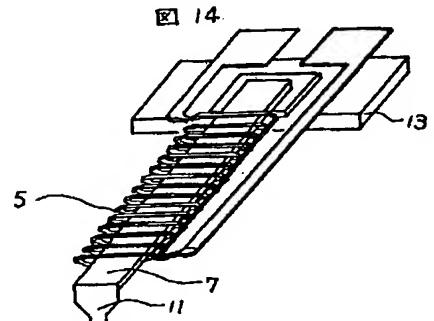
【図12】



【図13】



【図14】



フロントページの続き

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